

TITLE OF THE INVENTION  
CONTENT MANAGEMENT METHOD, RECORDING AND/OR REPRODUCING  
APPARATUS, AND RECORDING MEDIUM

CROSS-REFERENCE TO RELATED APPLICATIONS

5           This application is based upon and claims the  
benefit of priority from the prior Japanese Patent  
Application No. 2002-348925, filed November 29, 2002,  
the entire contents of which are incorporated herein by  
reference.

10                           BACKGROUND OF THE INVENTION

1. Field of the Invention

          The present invention relates to a content  
management method for managing content data and  
a recording and/or reproducing apparatus using the  
15 management method; and a recording medium having  
content data or the like recorded therein by the  
apparatus. More particularly, the present invention  
relates to a content management method, a recording  
and/or reproducing apparatus which enable predetermined  
20 movement of content data while preventing unlimited  
illegal copy; and a recording medium for the method and  
apparatus.

2. Description of the Related Art

          Conventionally, as a medium for recording  
25 digitized information (such as a document, a voice,  
an image, or a program, for example), a compact disk or  
a laser disk is used for a medium for recording a voice

or an image. In addition, a floppy disk or a hard disk is used for a medium for recording a program or data in a computer or the like. In addition to these recording mediums, a DVD (Digital Versatile Disk) which is a  
5 large capacity recording medium is developed.

In a variety of such digital recording mediums, digital data (including compressed or encoded data which can be decoded) is recorded intact during recording. Thus, recorded data can be copied from  
10 one medium to another medium easily and without losing a sound loss or an image quality, for example. Therefore, in these digital recording mediums, there is a problem that a large amount of copies can be produced, causing infringement of copyrights.

15 Concurrently, as a content encryption and/or decryption method of the conventional technique (Jpn. Pat. Appln. KOKAI Publication No. 09-136709), a copyright protection system called CSS (Content Scramble System) is introduced for a DVD-video disk  
20 used exclusively for reproduction in order to prevent illegal copy of contents.

In the above described conventional apparatus, however, movement of contents are carried out while illegal copy is prevented and copyrights are protected,  
25 and at the same time, reproduction of contents cannot be carried out by a conventional reproducing apparatus which is a general-purpose machine. That is, there

is a problem that there cannot be ensured user's convenience that, while movement of content data is carried out properly, reproduction by the conventional apparatus is carried out.

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#### BRIEF SUMMARY OF THE INVENTION

According to one embodiment of the present invention, there is provided a content management method, comprising: encrypting content data by a first key (TK); encrypting the first key by predetermined plural types of second keys (MUK); multiply encrypting the encrypted first key (Enc-TK) by a third key (MM); encrypting the third key by a predetermined fourth key (MMK); recording in a recording medium content data (Enc-Contents) encrypted by the first key, the first key (Enc-TK) encrypted by the predetermined plural types of second keys, and the first key (Enc2-TK) obtained by multiply encrypting the encrypted first key (Enc-TK) by the third key (MM), and recording the third key (Enc-MM) encrypted by the fourth key in a security region of the recording medium.

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#### BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

FIG. 1 is a block diagram depicting an example of encryption by a content management method according to an embodiment of the present invention;

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FIG. 2 is a block diagram depicting an example of decryption by a general method for contents encrypted by the content management method according to an

embodiment of the present invention;

FIG. 3 is a block diagram depicting an example of decryption by a method according to an embodiment of the present invention for the contents encrypted by the content management method according to an embodiment of the present invention;

FIG. 4 is a view showing an example of a recording medium having recorded therein the contents encrypted by the content management method according to an embodiment of the present invention;

FIG. 5 is an illustrative view illustrating an example of move of a move key (Move-Key: Enc2-TK) and a medium key (MB-Key: Enc-TK) by the content management method according to an embodiment of the present invention;

FIG. 6 is a block diagram depicting an example of a structure of a recording and/or reproducing apparatus to which the content management method according to an embodiment of the present invention is applied;

FIG. 7 is a block diagram illustrating a detailed example of an encrypting scheme in the case where the content management method according to an embodiment of the present invention is applied to the recording and/or reproducing apparatus;

FIG. 8 is a block diagram illustrating a detailed example of a decrypting scheme in the case where the content management method according to an embodiment

of the present invention is applied to the recording and/or reproducing apparatus;

FIG. 9 is a flow chart showing an operation for recording in a recording medium D1 the contents and key information encrypted by the content management method according to an embodiment of the present invention;

FIG. 10 is a flow chart showing an operation in the case where contents are moved from a recording medium D2 having recorded therein the contents encrypted by the content management method according to an embodiment of the present invention to another recording medium D2;

FIG. 11 is a flow chart showing an operation in the case where contents are moved from the recording medium D2 having recorded therein the contents encrypted by the content management method according to an embodiment of the present invention to another recording medium D3;

FIG. 12 is a flow chart showing an operation in the case where movement of contents are carried out with channel down from the recording medium D2 having recorded therein the contents encrypted by the content management method according to an embodiment of the present invention to such another recording medium D3;

FIG. 13 is a view showing an scheme for generating a security key (MM) in the content management method according to an embodiment of the present invention;

FIG. 14 is a view showing an example of a storage region for a move key (Move-Key: Enc2-TK) and a medium key (MB-Key: Enc-TK) in a recording medium in the content management method according to an embodiment of the present invention; and

FIG. 15 is a view showing an example of a table for a move key (Move-Key: Enc2-TK) and a medium key (MB-Key: Enc-TK) in a recording medium in the content management method according to an embodiment of the present invention.

#### DETAILED DESCRIPTION OF THE INVENTION

Hereinafter, a content management method, a recording and/or reproducing apparatus, and a recording medium according to the present invention will be described in detail with reference to the accompanying drawings. FIG. 1 is a block diagram depicting an example of encrypting by a content management method according to the present invention. FIG. 2 and FIG. 3 are block diagrams each showing an example of decrypting by a general method for the encrypted contents. FIG. 4 shows an example of a recording medium having recorded therein the encrypted contents. FIG. 5 is an illustrative view illustrating an example of move of a move key (Move Key: Enc2-TK) and a medium key (MB-Key: Enc-TK) by the content management method according to the present invention.

<General description of content management method

according to the present invention>

Now, a general description of the content management method according to the present invention will be given with reference to the accompanying drawings. First, an encrypting and/or decrypting scheme will be described below. The content management method according to the present invention is featured in that there are recorded in a recording medium: a move key (Move-Key: Enc2-TK) which assures movement of content data; and a medium key (MB-Key: Enc-TK) which assures reproduction by a reproducing apparatus, together with encrypted content data.

(encrypting)

An scheme for encrypting and/or recording content data in the content management method according to the present invention can be described by working of an AV encoder module M1 and working of a drive V1. In the AV encoder module M1 of FIG. 1, a visual (V) or audio (A) signal is encoded in a DVD format by means of an encoder 12, and the encoded signal is selected together with digital data 11 by means of a selector 13. Then, the selected signal is subjected to scramble (encryption) processing in a scramble circuit 14 by means of a title key (TK), and the processed signal is recorded as (Enc-Contents) in a disk D.

At this time, the title key (TK) is generated by means of a random number generator 18. The decrypted

key TK is decrypted in a decoder circuit 20 by means of a decryption key (MUK), and the decrypted title key (Enc-TK) is generated. Here, the encrypted key (MUK) having the encrypted title key (TK) is obtained as follows. By means of an MKB processor 17, a device key K1 (DvK116) is MKB-processed by using (MKB) data read out from a recording medium to generate a medium key (MMK), and further, the resultant key is generated after MID-processed by means of a MID processor 19.

10 Further, an encryption title key (Enc-TK) is multiply encrypted by means of a security key (MM), and a multiply encryption title key (Enc2-TK) is generated, and then, supplied to a selector 27 as with an encryption title key (Enc-TK).

15 Here, the security key (MM) is supplied by means of a random number generator 24. A device key (DvK2) specific to a drive V1 is subjected to MKB processing by means of an MKB processor 23 according to a given MKB from a recording medium. This security key (MM) is encrypted by means of the obtained encryption key (MMK), and an encrypted encryption key (Enc-MM) is obtained.

The thus obtained encrypted content data (Enc-Contents): a title key (Enc-TK) (= medium key (MB-key) encrypted by an encryption key (MUK); and  
25 a title key (Enc2-TK) (= move key (Move-Key)) multiply encoded by the second and third keys are each recorded



in recording regions of an optical disk D. Further,  
the previously encrypted third key (Enc-MM) is recorded  
in a security region of the optical disk D. An example  
of recording these signals into the optical disk D is  
5 shown in FIG. 4.

That is, both of the move key (Move-Key; Enc2-TK)  
and the medium key (MB-Key; Enc-TK) (one of them after  
movement of contents) are recorded into the optical  
disk D via a selector 27 according to a control signal  
10 from an R-Control 15 which is a recording processing  
control portion.

Here, in order to achieve reproduction and  
exchange of information recorded in an optical disk  
recording medium by another reproducing apparatus,  
15 identical key information (MK) is generated with  
a plurality of device keys (Dvk). Further, medium  
binding is carried out by medium specific information  
(M-ID), thereby preventing full copy into another  
medium.

20 As described later in detail, when contents are  
copied or moved, two encryption keys, i.e., the move  
key (Move-Key; Enc2-TK) and the medium key (MB-Key;  
Enc-TK) are selectively recorded in the optical disk D,  
thereby enabling reproduction by a general-purpose  
25 machine under a predetermined condition or processing  
for moving restrictive content data.

(Two reproducing schemes)

With respect to an optical disk D having recorded therein the content data thus encrypted as shown in FIG. 4 and the encrypted key information, as shown  
5 below, an optical disk D having at least a medium key (MB-Key; End-TK) recorded therein can be reproduced by means of a conventional general-purpose optical disk reproducing apparatus. Further, an optical disk D having only the move key (Move-Key; Enc2-TK) recorded  
10 therein is reproduced by means of only the optical disk reproducing apparatus in which the content management method according to the present invention is carried out.

That is, FIG. 2 is a view showing a decrypting  
15 process carried out by using only the medium key (MB-Key; Enc-TK) according to the present invention with a reproducing apparatus which is a conventional general-purpose machine. In this figure, in an optical disk D having at least a medium key (MB-Key; Enc-TK)  
20 recorded therein, the medium key block information (MKB) and medium specific information (M-ID) recorded in advance in a medium; and a medium key (MB-Key; Enc-TK) are supplied to an AV decoder module M2 via a bus authentication 21. Further, encrypted content data  
25 (Enc-Contents) are supplied to an AV decoder module M2.

The encrypted content data (Enc-Contents) are processed to be de-scrambled (decryption) by means of a

title key (TK) in a de-scrambler 29, and the resultant data is reproduced after supplied to an AV decoder 30. Here, the title key (TK) is obtained by an encryption title key (Enc-TK) being read out from the disk D,  
5 sent to a decrypting portion 28, and decrypted by an encryption key (MUK). In addition, as with the recording side, the encryption key (MUK) is acquired by means of the MKB processor 17 and MID processor 19 based on medium key block information (MKB) and medium  
10 specific information (M-ID).

In this manner, even in the conventional optical disk reproducing apparatus or the like which does not carry out processing by the content data management method according to the present invention, the content  
15 data contained in the optical disk D having the medium key (MB-Key; Enc-TK) recorded therein can be reproduced.

On the other hand, as shown in FIG. 3, in an optical disk D in which only the move key (Move-Key, Enc2-TK) is assigned, processing by the content data  
20 management method according to the present invention is carried out, thereby enabling reproduction.

That is, a drive V1 to which medium key block information (MKB), an encryption title key (Enc-MM), a  
25 multiply encryption title key (Enc-2-TK), and encrypted contents (Enc-Contents) are assigned from an optical disk unit obtains a security key (MM) by decrypting it

by a decrypting portion 31 using a key (MMK) obtained  
by subjecting it to an MKB process 23 by a device key  
(DvK2) specific to the drive V1. In this manner, the  
multiply encryption title key (Enc2-TK) is decrypted  
5 into an encryption title key (Enc-TK), and is supplied  
to a module M2 via the bus authentication 21.

In the module M2, a device key (DvK) specific to  
the module M2 is subjected to an MKB process 17 based  
on the medium key block information (MKB), and the  
10 encrypted title (Enc-TK) is decrypted at a decrypting  
portion 28 by means of the encryption key (MUK)  
obtained by subjecting it to an MID process 19 based  
on medium specific information (M-ID), thereby  
obtaining a title key (TK).

15 Using this title key (TK), the encrypted content  
data (Enc-Contents) is decrypted by means of a  
de-scramble portion 29, whereby the content data can  
be supplied to an AV decoder 30.

In this manner, in a disk D in which only the move  
20 key (Move-Key; Enc2-TK) is assigned, reproduction or  
move which will be described later is enabled only by  
an optical disk recording and/or reproducing apparatus  
which carries out processing by the content data  
management method according to the present invention.  
25 (Moving contents by the content management method  
according to the present invention)

Now, a general description of an scheme for moving

content data by the content data management method according to the present invention will be given by way of example. In FIG. 5, in the content data management method according to the present invention, two types of  
5 keys, i.e., a move key (Move-Key; Enc2-TK) and a medium key (MB-Key; Enc-TK) are used, and these keys are recorded in a recording medium as required, whereby restriction on reproduction, copy, or move can be applied. That is, according to the content data  
10 management method according to the present invention, there exist three types of recording mediums such as an optical disk, "a medium key (MB-Key) and a move key (Move-Key)", "only a medium key (MB-Key)", and "only a move key (Move-Key)". Here, a description of content  
15 data or the like is eliminated, and only the two keys, i.e., the medium key and move key, will be generally described.

In FIG. 5, with respect to copy limited source contents S, a medium key (MB-Key) and a move key  
20 (Move-Key) are assigned to a first disk D1 (recording medium). In this manner, reproduction by a reproducing apparatus according to the present invention as well as a general reproducing apparatus is enabled.

Next, in the case where the content data in the  
25 disk D1 is moved to a new disk D2 by means of the reproducing apparatus according to the present invention, the move key (Move-Key) is deleted from

the disk D1, and a disk D1' having only the medium key (MB-Key) is obtained. Only the move key (Move-Key) is recorded in the new disk D2. In this manner, the disk D1' can be reproduced by the general reproducing apparatus only. In addition, the disk D2 cannot be reproduced by the general reproducing apparatus. This disk can be reproduced or processed to be moved by only the recording and/or reproducing apparatus according to the present invention.

Further, in the case where the content data in the disk D2 which serves as such a move key (Move-Key) is moved to a new optical disk D3, the move key (Move-Key) of the optical disk D2 is deleted by means of the reproducing apparatus according to the present invention, and cannot be reproduced again. Only the move key (Move-Key) is recorded in the optical disk D3, and the disk can be reproduced or processed to be moved by only the recording and/or reproducing apparatus according to the present invention.

Furthermore, in moving the content data from the optical disk D by the recording and/or reproducing apparatus according to the present invention, the target is not limited to the optical disk. A general digital recording medium such as an SD (Secure Digital) is also targeted to be moved. Here, the move key (Move-Key) can be moved from the optical disk D3 to the SD (Secure Digital) card D4. As is the case with

moving the optical disk D3 from the previous optical disk D2, the move key (Move-Key) is deleted from the optical disk D3, and cannot be reproduced. Only the move key (Move-Key) is recorded in the SD (Secure  
5 Digital) card D4, and the disk can be reproduced or processed to be moved by only the recording and/or reproducing apparatus according to the present invention.

<Application example of the content management method  
10 according to the present invention>

Now, an embodiment in the case where the content management method according to the present invention is applied to a specific optical disk recording and/or reproducing apparatus will be described in detail with  
15 reference to the accompanying drawings. FIG. 6 is a block diagram depicting an example of a structure of a recording and/or reproducing apparatus to which the content management method according to the present invention is applied. FIG. 7 is a block diagram  
20 illustrating a detailed example of a decrypting scheme in the case where the scheme is applied to the recording and/or reproducing apparatus. FIG. 8 is a block diagram illustrating a detailed example of a decrypting scheme.

25 (Recording and/or reproducing apparatus)

FIG. 6 shows an optical disk recording and/or reproducing apparatus A to which the content management

method according to the present invention is applied.  
The optical disk recording and/or reproducing apparatus  
A has a control portion consisting of: a system control  
portion 162 which governs the entire operation; a RAM  
5 161 serving as a work area; a ROM 160; and a servo  
control portion 152. Further, this apparatus has  
an optical pickup 154 which irradiates laser beam to  
an optical disk D; and a signal processing portion 156  
which receives a detection signal for reproduction or  
10 supplies a signal for recording, thereby carrying out  
ECC processing or the like. The apparatus A has a bus  
authenticating portion 21 described previously in  
FIG. 1 or the like. Further, the apparatus has a bus  
authenticating portion 21 provided via a cable  
15 similarly, and has a data processing portion 158  
which carries out encoding or decoding and the like.  
In addition, a medium reader and/or writer 166 which  
is an interface for a recording medium such as an SD  
card is connected to the signal processing portion 156.  
20 An interface 165 which carries out signal input or  
output with a RAM 159 or an external device is  
connected to the data processing portion 158.  
Furthermore, the apparatus A has: servo control system  
processor circuits 155 connected to the above described  
25 servo control portion 152; an actuator driver 153  
connected thereto; and a disk motor 151.

In the optical disk unit A having such a



configuration, the system control portion 162 uses the RAM 161 as a work area, and carries out predetermined operation in accordance with a program including the present invention, the program being recorded in the ROM 160. The laser beam outputted from the optical pickup 154 is irradiated on an optical disk D. The reflection light from the optical disk D is converted into an electrical signal by means of a head amplifier. This electrical signal is inputted to the signal processing portion 156. An RF amplifier or the like is included in the signal processing portion 156.

During recording operation, the encrypting process described in detail with reference to FIG. 1 is applied to content data, and a recording process is carried out for the optical disk D. In more detail, the data processing portion 158 assigns an error detecting code (EDC) or ID to content data sent via the interface 165 by using a write clock produced via a write channel circuit (not shown), and applies data scramble processing using the above described encoding. Further, this data processing portion assigns an error correcting code (ECC), assigns a synchronizing signal, modulates a signal other than the synchronizing signal, and records a signal in the optical disk D by using the laser beam controlled by right strategy optimal to a compatible medium.

During reproducing operation, the decoding process

described in detail with reference to FIG. 2 and FIG. 3 is applied to content data, and reproduction processing of the content data stored in the optical disk D is carried out. In more detail, the RF signal read out from the head amplifier of the optical pickup 154 is sent to a PLL circuit (not shown) in the signal processing portion 156 through an optimal equalizer. Channel data is read out by a read clock produced by a PLL circuit. The decrypting process using the above described decrypting is applied to the read data. Further, the decrypted data is synchronized by means of the data processing portion 158, and symbol data is read out. Then, a de-scramble process using error correction or the above described decrypting process is carried out, and the de-scrambled data is transferred to the outside through the interface 165.

In this manner, the recording process and reproducing process is applied by means of the above described optical disk recording and/or reproducing apparatus A.

In addition, the signal processing portion 156 and data processing portion 158 each has a bus authenticating portion 21, and provides safeguard against a third person who extracts a signal by disconnecting a cable from both parties, and attempts to make illegal copy. That is, each bus authenticating portion 21 has a random number generator (not shown). In this manner,

this generator generates the same encryption key,  
encrypts transmission information, and transmits it to  
the remote party. The remote device having received  
transmission signal decrypts the encrypted transmission  
5 information by the same encryption key which has been  
locally generated. This encryption key is changed and  
generated according to a predetermined time, thus  
making it difficult for the third person to reproduce  
it. As long as the encryption key at this time cannot  
10 be reproduced, even if a signal is extracted by cable  
disconnection, illegal copy of content data or the like  
cannot be made.

(Security of encryption key by modulation and/or  
demodulation process)

15 A security process for encryption key information  
having applied thereto an operation of a modulator  
and/or demodulator circuit carried out by the signal  
processor circuit 156 will be described here.

At essential portions of the content management method  
20 for the recording process shown in FIG. 7, an AV  
encoder module M1 is identical to that shown in FIG. 1.  
At essential portions of the content management method  
for the recording process shown in FIG. 8, an AV  
decoder module M2 is identical to that shown in FIG. 3.  
25 A duplicate description is omitted here.

At a drive portion V3 of FIG. 7, in addition to a  
configuration of the drive V1 of FIG. 1, an ECC circuit

or the like is shown. That is, a signal from a content  
scramble 14 which is main data is modulated by means of  
a modulator circuit 44 when an error correcting signal  
is assigned by means of an ECC circuit 43. Further,  
5 an encrypted security key (Enc-MM) as well is subjected  
to error correction encoding by means of an ECC circuit  
47, and the encrypted key is modulated by means of a  
second modulator circuit 48. Then, the modulated key  
is replaced with part of the main data by means of a  
10 selector 45, and is recorded in a storage region of the  
optical disk D by means of a write channel circuit 46.

On one hand, at a drive portion V4 of FIG. 8, data  
to which an error correction code is assigned is read  
out from the optical disk D, and the read out data is  
15 demodulated by means of the second modulator circuit  
45. Then, an encrypted security key (Enc-MM) can be  
extracted by means of the ECC circuit 46. On the other  
hand, in FIG. 7, the encrypted security key (Enc-MM) is  
modulated and recorded by using the second modulator 48  
20 which is different from the modulator 44 for main data.  
Thus, the encrypted security key (Enc-MM) cannot be  
demodulated at the demodulator 42 for main data at  
a readout portion, and the key is processed as error  
data. In this manner, the third person cannot extract  
25 the encrypted security key (Enc-MM) for the purpose of  
illegal copy. By thus applying the modulation and/or  
demodulation process, security information which cannot

be detected by general main data modulation processing can be produced. In addition, processing can be carried out in the same manner such that encrypted key information (Enc-MM) is substantially recorded and reproduced in a security region. In this manner, even with a passive recording medium such as an optical disk, it becomes possible to construct a high level protection system.

(Moving flow chart 1)

A process for moving content data briefly described previously between recording mediums will be described in detail by way of flow chart. FIG. 9 is a flow chart showing an operation for recording into a recording medium D1 the contents and key information encrypted by the content management method according to the present invention. FIG. 10 is a flow chart showing an operation in the case where contents are moved from the recording medium D1 to another recording medium D2. FIG. 11 is a flow chart showing an operation in the case where contents are moved from the recording medium D2 to another recording medium D3. FIG. 12 is a flow chart showing an operation in the case where this moving is carried out with channel down.

The content management method according to the present invention is achieved with a configuration of the signal processing portion 156 and data processing portion 158 in the optical disk recording and/or

reproducing apparatus, as described above. These processes can be carried out even by means of a program or the like describing procedures for applying the content management method to detection information.

5 Hereinafter, the content management method according to the present invention will be described in detail by way of flow chart.

In the flow chart shown in FIG. 9, a description will be given with respect to a case in which content data is copied from copy limited content data S to a recording medium D1 such as an optical disk D.

10 First, medium key block information (MKB) for generating key information (MK); and medium specific information (M-ID) are read out from the recording medium D1, and these items of information are transferred to an AV encoder portion M1 (S11). Then, at the AV encoder portion M1, key information (MK) is extracted from the medium key block information (MKB) by using a device specific decryption key (DvK1) 16.

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20 Then, an encryption key (MUK) for encrypting a title key is generated from the key information (MK) and the medium specific information (M-ID) (S12).

Next, a title key (TK) is generated by means of a random number generating process. Then, the content data for which copyright protection has been specified is scramble-encrypted by means of the title key (TK) (S13). Then, the title key (TK) is encrypted by means

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of a key (MUK) for encrypting a title key, and the encryption title key (Enc-TK) is generated (S13). Then, the encrypted contents (Enc-Contents) and encryption title key (Enc-TK) are transferred to the drive V1 via a bus authenticating portion (S14).

Here, it is determined whether or not recording contents are enabled to be moved (S15). When the determination result is affirmative, a security key (MM) is generated by means of a random number generating process. Then, the encryption title key (Enc-TK) is multiply encrypted by means of the security key (MM), and a multiply encryption title key (Enc-TK) is generated. Then, a medium key (MB-Key) for the encrypted contents (Enc-Contents) and a group of encryption title keys (Enc-TK) and a move key (Move-Key) for a group of the multiply encryption title keys (Enc2-TK) are recorded in the recording medium D1 (S16).

Further, by means of a device key (DvK2) in the drive V1, an encryption key (MMK) is detected based on medium key block information (MKB). A security key (MM) is encrypted by means of the encryption key (MMK), and an encrypted encryption key (Enc-MM) is generated (S17). Then, a signal of the encrypted encryption key (Enc-MM) is recorded in a security region (S18).

If the determination result is negative in the step S15, a medium key (MB-Key) for encrypted contents

(Enc-Contents) and a group of encryption title keys (Enc-TK) is recorded in the recording medium D1 (S19).

By means of these processes, content data is encrypted, and both of the move key (Move-Key; Enc2-TK) and the medium key (MB-Key; Enc-TK) or only the medium key, which are features of the content management method according to the present invention, are/is recorded in the optical disk D1.

(Moving flow chart 2)

10 In the flow chart shown in FIG. 10, a description will be given with respect to an operation in the case where contents are moved from a recording medium D1 to another recording medium D2.

15 First, medium key block information (MKB) and medium specific information (M-ID) are read out from a move destination recording medium D2, and an encryption key (MUK2) is generated therefrom. Next, a recording medium D1 is set, and content management information is detected (S22). Here, it is determined whether or not  
20 the corresponding content medium key (MB-Key) and move key (Move-Key) are present (S23).

When it is determined that only the move key (Move-Key) is present in the step S23, an encryption key (MMK) is detected by using medium key block  
25 information (MKB) and a device key (DvK2). Then, an encrypted encryption key (Enc-MM) is decrypted, and a security key (MM) is detected. Then, a multiply



encryption title key (Enc2-TK2) is decrypted by means of a security key (MM), and an encryption title key (Enc-TK) is generated (S31).

5       When both of the medium key (MB-Key) and move key (Move-Key) are present at the step S23, the medium key block information (MKB) in the recording medium D1 and medium specific information (M-ID) are transferred through bus authentication, and an encryption key (MUK) is detected by means of a device specific encryption  
10      key (DvK1) (S24). Further, an encryption title key (Enc-TK) is decrypted by means of an encryption key (MUK), and a title key (TK) is generated. Furthermore, encrypted contents are read out from the recording medium D1, and the read out contents are decrypted  
15      by means of a title key (TK). Then, the decrypted contents are re-scrambled (encrypted) by means of a title key (TK2) generated by a new random number generator, and the encrypted contents are temporarily recorded (S25). Then, a multiply encryption title key  
20      (Enc2-TK) which is a move key (Move-Key) of the corresponding contents of the recording medium D1 is deleted (S26).

25       Then, the current recording medium is changed to a recording medium D2; a title key (TK2) is encrypted by means of an encryption key (MUK2); and an encryption title key (Enc-TK2) is generated (S27). Then, a new security key (MM2) in a recording drive is generated;

an encryption title key (Enc-TK2) is multiply encrypted; and a multiply encryption title key (Enc2-TK2) is generated.

5 Then, an encryption key (MMK) is generated by using the medium key block information (MKB) in the recording medium D2; and the device key (DvK2); a security key (MM2) is encrypted; and an encrypted encryption key (Enc-MM2) is generated (S28).. Next, the encrypted contents (Enc-Contents) encrypted by the title key (TK2) and the multiply encryption title key  
10 (Enc2-TK2) are recorded in the recording medium D2. Further, the encrypted encryption key (Enc-MM2) is recorded in a security region (S29).

In addition, when no move key (Move-Key) is  
15 present in the step S23, moving is disabled (S30).

In this manner, the move key (Move-Key) is deleted from the move source recording medium D1, and only the medium key (MB-Key) is obtained. Then, moving of content data is disabled. As a result, reproduction  
20 can be carried out by means of a reproducing apparatus which is a conventional general-purpose machine, but moving of the content data is disabled. On the other hand, only the move key (Move-Key) is present in the move destination recording medium D2. Reproduction  
25 and further moving are enabled with only a dedicated machine capable of implementing the content management method according to the present invention.

(Moving flow chart 3)

In the flow chart shown in FIG. 11, a description will be given with respect to an operation in the case where contents are moved from the recording medium D2 to another recording medium D3.

First, medium key block information (MKB) and medium specific information (M-ID) are read out from the move destination recording medium D3, and an encryption key (MUK2) is generated (S21).

Next, the recording medium D2 is set, and content management information is detected (S22). Then, it is determined whether or not the corresponding content medium key (MB-Key) and move key (Move-Key) are present (S23).

When no move key (Move-Key) is present, moving content data is disabled (S30).

When it is determined that only the move key (Move-Key) is present, an encryption key (MMK) is extracted by using medium key block information (MKB) and a device key (DvK2). Then, an encrypted encryption key (Enc-MM is decrypted), and a security key (MM) is detected. Then, a multiply encryption title key (Enc2-TK2) is decrypted by means of a security key (MM), and an encryption title key (Enc-TK2) is generated (S31).

When it is determined that the medium key (MB-Key) and move key (Move-Key) are present in the step S23, the medium key block information in the recording

medium D2 and the medium specific information (M-ID) are transferred through bus authentication. Then, an encryption key (MUK2) for a title key is detected by means of a device specific decryption key (DvK1) (S42).  
5 Next, an encryption title key (Enc-TK) is decrypted by means of a decryption key (MUK2) for a title key, and a title key (TK2) is detected. Then, encrypted contents (EC-Contents) are read out from the recording medium D2, and the read out contents are temporarily  
10 stored (S43). Then, a multiply encryption title key (Enc2-TK2) which is a move key (Move-Key) for the corresponding contents of the recording medium D2 is deleted (S26).

Next, the current recording medium is changed to  
15 a recording medium D3; a title key (TK2) is encrypted by means of an encryption key (MUK2); and an encryption title key (Enc-TK3) is generated (S27). Next, a new security key (MM3) in the recording drive is generated; an encryption title key (Enc-TK3) is multiply  
20 encrypted; and a multiply encryption title key (Enc2-TK3) is generated. Then, an encryption key (MMK) is generated by using the medium key block information (MKB) in the recording medium D3 and the device key (DvK2); a security key (MM3) is encrypted; and an  
25 encrypted encryption key (Enc-MM3) is generated (S28). Then, the encrypted contents (Enc-Contents) encrypted by the title key (TK2) and the multiply encryption

title key (Enc2-TK3) are recorded in the recording medium D3, and the encrypted encryption key (Enc-MM3) is recorded in the security region (S29). The encryption title key (Enc-TK3) in the flow chart 3 of FIG. 11 includes a plenty of the steps common to the flow chart 2 of FIG. 10, but is different therefrom in that, in the steps S42 and S43, the title key (TK2) is encrypted by means of the encryption key (MUK2), and the encryption title key (Enc-TK3) is generated.

In this manner, in the move source recording medium D2, the move key (Move-Key) is deleted, thus making it impossible to move or reproduce content data. On the other hand, in the move destination recording medium D3, only the move key (Move-Key) is obtained, thus enabling reproduction and further moving by only the dedicated machine capable of implementing the content management method according to the present invention.

In addition, a recording medium targeted by the content management method according to the present invention is not limited to an optical disk, and can include a general digital recording medium such as an SD (Secure Digital) card D4 or the like, as shown in FIG. 5.

(Moving flow chart 4)

Further, in a process for moving content data shown in the flow chart of FIG. 11, a description will

be given with respect to a case in which multi-channel audio source data (5.1 channels) is processed by reducing the channel down to 2 channels. These processes are basically identical to those shown in the flow chart of FIG. 11. The step S42 and step S43 in the flow chart of FIG/ 11 are carried out by means of a process substituted for the step S44.

That is, in the step S44 of the flow chart of FIG. 12, an encryption title key (Enc-TK) is decrypted by means of an encryption key (MUK2), and a title key (TK2) is generated. Then, encrypted contents (Enc-Contents) are read out from the recording medium D2, and the read out contents are decrypted by means of a title key (TK2). Further, multi-channel audio source data is reduced down to 2 channels; the data is scrambled (encrypted) again by means of a title key (TK3) generated by a random number generator, and the encrypted data is temporarily recorded (S44).

In such a process, while audio source data (5.1 channels) is reduced down to 2 channels, content data can be moved from the recording medium D2 to a new recording medium D3. Its advantageous effect is identical to the moving process in the flow chart of FIG. 11.

(Method for increasing key information and key for each music item file)

Furthermore, content data targeted by the content

management method according to the present invention can take a form of a plurality of voice files as music information on a plurality of music items, for example. A plurality of information may be stored in a visual  
5 image file or an image file, for example. Here, a description will be given by way of example of voice file. In this form, different title keys (TK) supplied by a random number generator 18 shown in FIG. 1 are provided on a file by file basis, and each of these  
10 keys is encrypted, thereby enabling move to another recording medium for each music item of music information. In this manner, the degree of freedom for user's content utilization can be improved very remarkably.

15 However, if move keys (move-Key = Enc2-TK) are generated to be associated with a plurality of title keys (TK) on a one by one basis, there occurs a need to provide security keys (MM) in the drive portion V1 by the number of a plurality of music files. However, if  
20 the security keys (MM) are provided by the number of music items, and then, all of these keys are stored in a security region of an optical disk D, it is not preferable since the security region requires a large storage capacity, causing an increase in storage  
25 capacity. In particular, in a security information recording system using the above modulation and/or demodulation process, while part of the main data is

damaged, and security information is recorded. This situation is not preferable in reproduction processing of the main data, and thus, it is desirable to reduce security information to the minimum.

5           Because of this, a plurality of keys are increased in accordance with predetermined procedures based on a security key (MM); the increased keys are used for encryption; and only the security key (MM) which is a source of increase is stored in the security region,  
10           thereby making it possible to manage a plurality of files, while reducing the storage capacity of the security region.

          FIG. 13 is a view showing a scheme for generating a security key (MM) in the content management method  
15           according to the present invention. In this figure, in the random number generator 24 or the like of FIG. 1, a security key (MM1) is generated based on key source data (MM) generated from a random number G61, and then, a specific function K is multiplied by a content data  
20           identification code or the number determined by order numbers or the like, whereby new security keys (MM2 to MMn) are generated. By using a plurality of these security keys (MM2 to MMn), a plurality of encryption title keys (Enc-TK1 to Enc-TKn) 63-1 to n are subjected  
25           to encryption 64.

          However, only the encrypted encryption key (Enc-MM) having key source data (MM) encrypted therein



may be stored in the security region, and thus, the required storage capacity of the security region is not increased. Therefore, it becomes possible to manage contents of a number of plural files while maintaining high security.

(Management information)

In the content management method according to the present invention, reproduction or moving of content data is managed by means of a move key (Move-Key) and a medium key (MB-key). Thus, these encryption key files are especially important data as is the case with encrypted contents. That is, if an encrypted encryption key cannot be decrypted, the encrypted contents cannot be decrypted or reproduced, either.

Because of this, as shown in FIG. 14, in a data area of a recording medium (for example, an optical disk), a move key (Move-Key) file and a medium key (MB-Key) file are provided in different file regions. Then, one table is allocated in each ECC block, and each table is written in quadruple in 4 ECC blocks, thereby improving data reliability.

A table of these files is shown in FIG. 15. That is, in a recording medium, there exist three types of keys, "a medium key (MB-Key) and a move key (Move-Key)", "only a medium key (MB-Key)", and "only a move key (Move-key)". In addition, in the case where a large number of content files exist, it is required

to easily read out a relationship between the medium  
key (MB-Key) and move key (Move-Key) relevant to  
a respective one of the content encryption keys from  
individual management. Because of this, in the move  
5 key (Move-Key) table and the medium key (MB-Key) table  
shown in FIG. 15, these tables are configured by  
providing a pair of information, i.e., information  
indicating the presence or absence of an encryption  
key associated with a respective one of the encrypted  
10 encryption keys and information utilized in the case  
where the method for generating the security key (MM)  
shown in FIG. 13 is employed. By listing these tables,  
it becomes possible to easily determine whether moving  
contents is enabled with respect to the respective  
15 content data.

By a variety of embodiments described above, one  
skilled in the art can achieve the present invention...  
Further, a variety of modifications of these  
embodiments can be easily conceived by one skilled in  
20 the art, and can be applied to a variety of embodiments  
even if one skilled in the art does not have inventive  
ability. Therefore, the present invention covers a  
broad range which is not contradictory to the disclosed  
principle and novel features, and is not limited to the  
25 above described embodiments.

For example, with respected to a security region  
in which a security key is to be stored, when the above

described modulation and/or demodulation process is used, a region for recording and/or reproducing security information may be associated with a recording and/or reproducing area other than main data.

5 By employing such a method, the main data does not include an error component, and thus, the reliability of content data is not lost.

As has been described in detail, according to the present invention, the move key (Move-key: Enc2-TK)  
10 for assuring movement of content data and the medium key (MB-Key: Enc-TK) for assuring reproduction by a reproducing apparatus which is a conventional general-purpose machine (such as an optical disk, for example) are recorded in a recording medium together  
15 with encrypted content data. In the recording and/or reproducing apparatus according to the present invention capable of decrypting a security key stored in a security region, reproduction or moving by the move key (Move-Key) is enabled. In the reproducing  
20 apparatus which is the conventional general-purpose machine, reproduction by the medium key (MB-Key) is assured. In this manner, a moving process by a dedicated machine is enabled while the spread of content data is prevented. In addition, reproduction  
25 of content data by the conventional machine is enabled.